

The PREFACE.

World, and for the discovery of many others hitherto unknown, and to make us, with the great Conqueror, to be affected that we have not yet overcome one World when there are so many others to be discovered, every considerable improvement of Telescopes or Microscopes producing new Worlds and Terra-Incognita's to our view.

The Glasses I used were of our English make, but though very good of the kind, yet far short of what might be expected, could we once find a way of making Glasses Elliptical, or of some more true shape; for though both Microscopes, and Telescopes, as they now are, will magnifie an Object about a thousand thousand times bigger then it appears to the naked eye; yet the Apertures of the Object-glasses are so very small, that very few Rays are admitted, and even of those few there are so many false, that the Object appears dark and indistinct: And indeed these inconveniences are such, as seem inseparable from Spherical Glasses, even when most exactly made; but the way we have hitherto made use of for that purpose is so imperfect, that there may be perhaps ten wrought before one be made tolerably good, and most of those ten perhaps every one differing in goodness one from another, which is an Argument, that the way hitherto used is, at least, very uncertain. So that these Glasses have a double defect; the one, that very few of them are exactly true wrought; the other, that even of those that are best among them, none will admit a sufficient number of Rayes to magnifie the Object beyond a determinate bigness. Against which Inconveniences the only Remedies I have hitherto met with are these.

First, for *Microscopes* (where the Object we view is near and within our power) the best way of making it appear bright in the Glas, is to cast a great quantity of light on it by means of *convex glasses*, for thereby, though the aperture be very small, yet there will throng in through it such multitudes, that an Object will by this means indure to be magnifi'd as much again as it would be without it. The way for doing which is this. I make choice of some Room that has only one window open to the South, and at about three or four foot distance from this Window, on a Table, I place my *Microscope*, and then so place either a round Globe of Water, or a very deep clear *plano convex Glas* (whose convex side is turn'd towards the Window) that there is a great quantity of Rayes collected and thrown upon the Object: Or if the Sun shine, I place a small piece of oily Paper very near the Object, between that and the light; then with a good large Burning-Glas I so collect and throw the Rayes on the Paper, that there may be a very great quantity of light pass through it to the Object; yet I so proportion that light, that it may

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may not singe or burn the Paper. Instead of which Paper there may be made use of a small piece of Looking-glass plate, one of whose sides is made rough by being rubb'd on a flat Tool with very fine sand, this will, if the heat be leisurely cast on it, indure a much greater degree of heat, and consequently very much augment a convenient light. By all which means the light of the Sun, or of a Window, may be so cast on an Object, as to make it twice as light as it would otherwise be without it, and that without any inconvenience of glaring, which the immediate light of the Sun is very apt to create in most Objects; for by this means the light is so equally diffused, that all parts are alike inlightned; but when the immediate light of the Sun falls on it, the reflexions from some few parts are so vivid, that they drown the appearance of all the other, and are themselves also, by reason of the inequality of light, indistinct, and appear only radiant spots.

But because the light of the Sun, and also that of a Window, is in a continual variation, and so many Objects cannot be view'd long enough by them to be thoroughly examin'd; besides that, oftentimes the Weather is so dark and cloudy, that for many dayes together nothing can be view'd: And because also there are many Objects to be met with in the night, which cannot so conveniently be kept perhaps till the day, therefore to procure and cast a sufficient quantity of light on an Object in the night, I thought of, and often used this, Expedient.

I procur'd me a small Pedestal, such as is describ'd in the fifth Figure of the first Scheme on the small Pillar A B, of which were two movable Armes C D, which by means of the Screws E F, I could fix in any part of the Pillar; on the undermost of these I plac'd a pretty large Globe of Glas G, fill'd with exceeding clear Brine, stop't, inverted, and fixt in the manner visible in the Figure; out of the side of which Arm proceeded another Arm H, with many joynts; to the end of which was fastned a deep plain *Convex glass* I, which by means of this Arm could be moved too and fro, and fixt in any posture. On the upper Arm was placed a small Lamp K, which could be so mov'd upon the end of the Arm, as to be set in a fit posture to give light through the Ball: By means of this Instrument duly plac'd, as is exprest in the Figure, with the small flame of a Lamp may be cast as great and convenient a light on the Object as it will well indure; and being always constant, and to be had at any time. I found most proper for drawing the representations of those small Objects I had occasion to observe.

None of all which ways (though much beyond any other hitherto made use of by any I know) do afford a sufficient help, but after a certain degree of magnifying, they leave us again in the lurch. Hence it were very desirable, that some way were thought of for making the Object-glass of such a Figure as would conveniently bear a large Aperture.

As for Telescopes, the only improvement they seem capable of, is the increasing of their length; for the Object being remote, there is no thought of giving it a greater light then it has; and therefore to augment the Aperture, the Glas must be ground of a very large sphere; for, by that means,